

In the Claims

1 Claims 1-14 (Cancelled)

1 15. (Original) A method for determining the location of a contaminant in a fluid flow system,
2 comprising the steps of:

3 (a) injecting a conservative tracer and a partitioning tracer into the flow system at a
4 first location;

5 (b) advecting the tracers along the flow system at a first velocity to create an advection
6 flow field;

1 (c) extracting the tracers at a second location in the flow system;

2 (d) introducing a perturbation to the advection flow field at a perturbation time by
3 changing and then re-establishing the advection flow at a second velocity, which
4 may be different than the first velocity, creating a unique change in the
5 concentration of the partition tracer;

6 (e) extracting the partitioning tracer as a function of time relative to the perturbation
7 time;

8 (f) measuring the concentration of the partitioning tracer as a function of the time; and

9 (g) determining the location of contamination from the time of arrival of the
10 partitioning tracer relative to the perturbation time and the advection flow velocity.

1 Claims 16-32 (Cancelled)

1 33. (Previously presented) The method of claim 15 wherein the injecting and the advecting in

2 steps (a) and (b) of claim 15 are done to inundate the entire fluid flow system with the tracers.

1 34. (Previously presented) The method of claim 15 wherein a plurality of partitioning tracers
2 are used.

1 35. (Previously presented) The method of claim 15 wherein the presence of the partitioning
2 tracer after the perturbation needed for location of the contaminant is also used to detect the
3 presence of the contaminant.

1 36. (Previously presented) The method of claim 15 wherein the time of arrival is determined
2 from the leading edge of the tracer concentration curve.

1 37. (Previously presented) The method of claim 15 wherein said second flow velocity is
2 determined from the mean time of arrival of the tracer at said second flow rate.

1 38. (Previously presented) The method of claim 15 wherein the location of the contamination
2 is further comprised of the steps of (a) extracting the partitioning tracer at said second location at
3 said first flow rate and measuring the concentration of the partitioning tracer over a period of time
4 and (b) determining the location of the contaminant from (1) the times of arrival of the partitioning
5 tracer relative to the start time of the second advection flow after the perturbation and to the start
6 time of the first advection flow and (2) the flow rates of the second advection flow and the flow
7 rate of the first advection flow.

1 39. (Previously presented) The method of claim 15 wherein the method of location can be used
2 to locate said contaminant at more than one location when the tracer concentrations from each
3 location are distinguishable.

1 40. (Previously presented) The method of claim 15 wherein the method of location can be used
2 to locate more than one contaminant in a fluid flow system by using one or more tracers that
3 interact with each contaminant.

1 41. (Previously presented) The method of claim 15 wherein the method of location can be used
2 to locate a plurality of contaminants at a plurality of locations.

1 Claims 42-47 (Cancelled)

1 48. (Previously presented) The method of claim 33 wherein the partitioning tracer that is
2 injected into the fluid flow system is allowed sufficient time for the tracer to interact with the
3 contaminant before the tracer is advected.

1 49. (Previously presented) The method of claim 33, wherein only the section of the fluid flow
2 system that is contaminated need be inundated with tracer.

1 50. (Previously presented) The method of claim 33 wherein the presence of the partitioning
2 tracer after the perturbation needed for location of the contaminant is also used to detect the
3 presence of the contaminant.

1 51. (Previously presented) The method of claim 33 wherein the time of arrival is determined
2 from the leading edge of the tracer concentration curve.

1 52. (Previously presented) The method of claim 33 wherein said second flow velocity is
2 determined from the mean time of arrival of the tracer at said second flow rate.

1 53. (Previously presented) The method of claim 33 wherein the method of location can be used
2 to locate said contaminant at more than one location when the tracer concentrations from each
3 location are distinguishable.

1 54. (Previously presented) The method of claim 33 wherein the method of location can be used
2 to locate more than one contaminant in a fluid flow system by using one or more tracers that
3 interact with each contaminant.

1 55. (Previously presented) The method of claim 33 wherein the method of location can be used
2 to locate a plurality of contaminants at a plurality of locations.

1 56. (Previously presented) The method of claim 35 wherein the method of detection can be
2 used to detect said contaminant at more than one location when the tracer concentrations from
3 each location are distinguishable.

1 57. (Previously presented) The method of claim 35 wherein the method of detection can be
2 used to detect more than one contaminant in a fluid flow system by using one or more tracers that
3 interact with each contaminant.

1 58. (Previously presented) The method of claim 35 wherein the method of detection can be
2 used to detect a plurality of contaminants at a plurality of locations.

1 59. (Previously presented) The method of claim 35 wherein said detecting is determined from
2 a comparison of the characteristic features of the measured concentrations of the conservative and
3 interactive tracers.

1 60. (Previously presented) The method of claim 50 wherein the method of detection can be
2 used to detect said contaminant at more than one location when the tracer concentrations from
3 each location are distinguishable.

1 61. (Previously presented) The method of claim 50 wherein the method of detection can be
2 used to detect more than one contaminant in a fluid flow system by using one or more tracers that
3 interact with each contaminant.

1 62. (Previously presented) The method of claim 50 wherein the method of detection can be
2 used to detect a plurality of contaminants at a plurality of locations.

1 63. (Previously presented) The method of claim 50 wherein said detecting is determined from
2 a comparison of the characteristic features of the measured concentrations of the conservative and
3 interactive tracers.

1 64. (Previously presented) The method of claim 37 wherein said mean time of arrival is

2 determined from the centroid of the tracer concentration curve.

1 65. (Previously presented) The method of claim 38 wherein the location is determined from
2 the product of the ratio of the time of arrival of the partitioning tracer at the second flow rate
3 relative to the first flow rate, the ratio of the flow rate of the partitioning tracer at the second flow
4 rate relative to the first flow rate, and the length of the fluid flow system between the injection and
5 extraction points.

1 66. (Previously presented) The method of claim 52 wherein said mean time of arrival is
2 determined from the centroid of the tracer concentration curve.

1 67. (Previously presented) The method of claim 50 wherein said characteristic features are
2 comprised of the magnitude of the tracer concentrations in certain regions of the concentration
3 curves such as the peak, the leading edge, or the trailing edge of the curves.

1 68. (Previously presented) The method of claim 50 where said comparison is accomplished
2 using said tracer concentration curves that represent only a fraction of the total concentration curve
3 that would have been measured if the collection time were extended.

1 69. (Previously presented) The method of claim 63 wherein said characteristic features are
2 comprised of the magnitude of the tracer concentrations in certain regions of the concentration
3 curves such as the peak, the leading edge, or the trailing edge of the curves.

1 70. (Previously presented) The method of claim 63 where said comparison is accomplished

- 2 using said tracer concentration curves that represent only a fraction of the total concentration curve
- 3 that would have been measured if the collection time were extended.

1 Claims 71-77 (Cancelled)